TECHNICAL APPENDIX 8.1: TERRESTRIAL ECOLOGY - FIELD SURVEY METHODOLOGY

1. FIELD SURVEY METHODOLOGY

1.1 Introduction

1.1.1 This ecology Technical Appendix should be read with reference to **Volume 1: Chapter 8: Terrestrial Ecology** of this EIA Report. Field surveys were carried out for the route selection and alignment phases of the project in August 2021 and for the EIA alignment between June and August 2022, with additional surveys being undertaken in February 2023 upon further refinement of the Proposed Development. Field survey methodology for habitats and protected species are detailed below.

1.2 Habitats and Vegetation

1.2.1 Habitats across the Study Area, as described in Section 8.3.1 of **Chapter 8:Terrestrial Ecology**, were mapped using the Phase 1 Habitat Classification (JNCC 2010)[1], with habitat boundaries and classification being recorded onto 1:10,000 scale Ordnance Survey (OS) maps. Where appropriate, maps are supplemented with target notes which provide specific information on habitats present that are too limited in extent to map at the scale at which data is presented, or the presence of species and habitats of ecological interest.

1.2.2 Following the field survey, the conservation status of each habitat recorded was identified based on the following:

- Annex I habitats listed on the EC Habitats Directive, as translated into British and Scottish law by The Conservation (Natural Habitats, &c.) Regulations 1994 and subsequent legislation;
- UK Biodiversity Action Plan (UKBAP) priority habitats. Although superseded by the UK Post-2010 Biodiversity Framework in 2012, the UKBAP remains a useful resource for assessing UK conservation status and informs regional conservation priorities; and
- Scottish Biodiversity List (SBL) priority habitats for conservation.

1.2.3 Plant species of national significance (as defined below) where present, were recorded as target notes:

- Higher plant species of Lower plants (bryophytes) listed as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU), on the respective red data lists for Great Britain as based on International Union for Conservation of Nature (IUCN) criteria;
- Nationally rare (NR) – occurring in 15 hectares or fewer in Great Britain; or
- Nationally scarce (NS) – occurring in 16-100 hectares in Great Britain; and
- UK Biodiversity Action Plan (UKBAP) priority species.

1.2.4 Any wetland habitats were evaluated in terms of their potential to be groundwater dependent terrestrial ecosystems (GWDTEs). This was done based on the hydrogeological setting of each habitat community identified, with reference to SEPA guidance (SEPA, 2014)[2] modified from the United Kingdom Technical Advisory Group (UKTAG) list of National Vegetation Classification (NVC) communities and associated groundwater dependency scores.

1.2.5 Nomenclature for vascular plants follows Stace (2010)[3], bryophytes and liverworts follow Atherton et al (2010)[4] and for lichens Dobson (2011)[5]. Phase 1 habitat maps were digitised using the ArcView 10.1 GIS package.

[1] JNCC (2010), *Handbook for Phase 1 Habitat Survey – a technique for environmental audit*. Joint Nature Conservation Committee: Peterborough

[2] Scottish Environmental Protection Agency (2014) *Land Use Planning System: Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems*

[3] Stace, C. A. (2010). *New Flora of the British Isles*, 3rd Edition. Cambridge University Press.

[4] Atherton, I. et al. (2010). *Mosses and Liverworts of Britain and Ireland: a field guide*. British Bryological Society.

[5] Dobson, F. S. (2011), *Lichens: An Illustrated Guide to the British and Irish Species,* 6th edition. The Richmond Publishing Co. Ltd, Slough.

1.2.6 Non-native and / or invasive terrestrial plants and algae were recorded onto 1:10,000 scale survey maps in the field. The locations of all non-native / invasive species were also recorded via the use of a handheld GPS and photographs taken to visually catalogue the record.

1.3 Protected Species

1.3.1 Protected species surveys were undertaken in August 2021 and between June and August 2022 in suitable weather conditions, with additional surveys in February 2023 following further refinement of the Proposed Development. Surveys for protected species were carried out within a 500 m survey corridor around the centre line of the proposed OHL alignment (i.e. 250 m survey corridor from the centreline) where suitable habitat was present, following the methodologies described below.

Otter (Lutra lutra)

1.3.2 Otter field signs that were searched for, as described in Bang & Dahlstrøm (2001)[6] and Sargent & Morris (2003)[7], include:

- holts – these are underground features where otters live. They can be tunnels within bank sides, underneath root plates or boulder piles, and even man-made structures such as disused drains. Holts are used by otters to rest up during the day and are the usual site of natal or breeding sites. Otters may use holts permanently of temporarily;
- couches – these are above ground resting-up sites. They may be partially sheltered, or fully exposed. Couches may be regularly used, especially in reed beds and on in-stream islands. They have been known to be used as natal and breeding sites. Couches can be very difficult to identify and may consist of an area of flattened grass or earth. Where rocks or rock armour are used as couches, these can be almost impossible to identify without observing the otter in situ;
- prints – otters have characteristic footprints that can be found in soft ground and muddy areas;
- spraints – otter faeces are often used to mark territories, usually deposited on in-stream boulders. They can be present within or outside the entrances of holts and couches. Spraints have a characteristic smell and often contain fish remains;
- feeding signs – the remains of prey items may be found at preferred feeding stations. Remains of fish, crabs or skinned amphibians can indicate the presence of otter;
- paths – these are terrestrial routes that otters take when moving between resting-up sites and watercourses or during high flow conditions when they will travel along bank sides in preference of swimming; and
- slides and play areas – slides are typically worn areas on steep slopes where otters slide on their bellies, often found between holts / couches and watercourses. Play areas are used by juvenile otters in play and are often evident by trampled vegetation and the presence of slides. These are often positioned in sheltered areas adjacent to the natal holt.

1.3.3 Any of the above signs are diagnostic evidence of the presence of otter, however, it is often not possible to identify couches with confidence unless other field signs are also present. Spraint is the most reliable identifiable evidence of the presence of this species.

1.3.4 Any evidence of otter presence was recorded onto 1:10,000 scale survey maps in the field. The location of all signs was also recorded via the use of a handheld GPS and photographs taken to visually catalogue the record.

[6] Bang, P. & Dahlstrom, P. (2001). *Animal Tracks and Signs.* Oxford University Press, Oxford.

[7] Sargent, G & Morris, P. (2003). *How to Find and Identify Mammals*. 2nd Edition. The Mammal Society.

Badger (Meles meles)

1.3.5 Badger field signs that were searched for, as described in Neal & Cheeseman[8], Bang & Dahlstrøm[9] and SNH (2002)[10], included:

- setts;
- prints;
- latrines (and dung pits used as territorial markers);
- hairs; and
- feeding signs (snuffle holes).

1.3.6 Any of the above signs can be taken as diagnostic evidence of the presence of badger.

1.3.7 Any evidence of badger presence was recorded onto 1:10,000 scale survey maps in the field. The location of all signs was also recorded via the use of a handheld GPS and photographs taken to visually catalogue the record.

Red Squirrel (Sciurus vulgaris)

1.3.8 Through areas of woodland, signs of feeding and evidence of active squirrel dreys were recorded. Field signs that were searches for, as described in Bang and Dahlstrøm (2001)[9] included:

- Dreys – comprised of an outer shell of twigs and branches, with an inner layer of mosses, leaves, grass and conifer needles. Dreys are usually built close to the main stem of a tree;
- Feeding signs – can be stripped and nibbled conifer cones, split hazelnuts, nibbles fungus and berries; and
- Prints – the forefoot has four long narrow toes with claws and its print is approximately 4 cm long and 2 cm wide. The hindfoot has 5 clawed toes and its print is approximately 5 cm long and 3 cm wide. The tracks lie close together in a jump group, with the fore-prints close together and behind the more widely spread hind-prints.

1.3.9 Any evidence of red squirrel presence was recorded onto 1:10,000 scale survey maps in the field. The location of all signs was also recorded via the use of a handheld GPS and photographs taken to visually catalogue the record.

Pine marten (Martes martes)

1.3.10 Pine marten signs that were searched for, as described in Bang and Dahlstrøm (2001)[9] included:

- scats – these are typically dark in colour and 4-12 cm long x 0.8-1.8 cm in diameter. They often have a coiled twisted appearance, typical of many mustelid scats. Scats will often contain food remains including fur, feathers, bone, plant content and seeds. Scats vary in size, shape and colour and it's difficult for even experts to identify some pine marten scats. Scats are placed in latrines at well-used dens, as well as at sites elsewhere in an individual's home range, where they probably fulfil a social communication role;
- footprints – the five-toes but slightly cat-like forefoot imprints measure approximately 40x45 mm for females and 55-65 mm for males; fur on the underside of the feet in winter may blur prints and make them look larger, especially in soft snow. Indistinct trails of bounding martens (stride length 60-100 cm) may resemble those of hares, with prints in groups of two or three where one or both hind feet have registered over prints of forefeet; and
- den sites – dens are usually not distinctive unless revealed by visible concentration of scats. Elevated den sites are preferred to keep martens safe from predators and provide insulation and shelter from the

[8] Neal, E. & Cheeseman, C. (1996). *Badgers. Poyser Natural History*, London

[9] Bang, P. & Dahlstrom, P. (2001). *Animal Tracks and Signs.* Oxford University Press, Oxford.

[10] Scottish Natural Heritage. (2002). *Badgers and Development. Scottish Wildlife Series*. SNH. https://www.snh.gov.uk/publications-data-and-research/publications/searchthe-catalogue/publication-detail/?id=65

elements, and so hollow trees, owl boxes and the roofs of dwelling houses are often used as well as purpose-built pine marten den boxes. Where such elevated dens are absent, they may den on the ground in rabbit burrows, rocky outcrops or under tree root plates.

1.3.11 Any evidence of pine marten presence was recorded onto 1:10,000 scale survey maps in the field. The location of all signs was also recorded via the use of a handheld GPS and photographs taken to visually catalogue the record.

Bats

1.3.12 In accordance with relevant guidance[11,12,13] a ground level survey of trees and any structures present within a 160 m survey corridor (the L0D plus 30 m either side of the proposed OHL alignment) to record any structures that could be suitable for bats to roost in. A visual inspection of trees from ground level using binoculars and a high-powered torch was completed to search for features which may provide potential roosting opportunities for bats. Where potential roost features (PRFs) were noted, their locations and a brief description of their character was recorded. Additionally, each feature was visually inspected for evidence indicating use by roosting bats such as droppings, urine staining, and scratch marks / characteristic staining (from fur oils).

1.3.13 PRFs in trees are generally damage and decay features such as knot holes, tear outs, cracks/splits, unions etc. which can often lead to cavity features forming which are used by bats. It is often unclear from a PRA if a PRF at height has a suitable cavity or not for bats unless closer inspection is carried out such as endoscope survey or an aerial inspection. Ground level surveys therefore can only indicate the potential suitability of a PRF and highlight the requirement for further surveys if required.

1.3.14 Trees and buildings were searched for potential roost features (PRFs) from the ground and categorised as low, moderate or high in accordance with their suitability for roosting bats as described in **Table 8A.1** below.

1.3.15 Based on the features present and the location of a given tree or structure, the potential for different types of bat roost was also considered. For the purpose of this assessment, potential roost types (where applicable) were grouped as follows:

- Summer / Maternity (breeding roost), optimal survey period May to August;
- Transitional (to include transitional, mating, satellite, night and day roosts), dependent on weather survey months are April, September and October; and
- Hibernation, optimal survey period December to February.

Bat Habitat Suitability

1.3.16 Habitats within the were assessed for their likely suitability to support foraging and commuting bats, taking account of guidance from the Bat Conservation Trust (BCT)[1], as summaries in **Table 8A.1**. Any potential roost features were recorded onto 1:10,000 scale survey maps in the field. The location of all signs and potential roost features was also recorded via the use of a handheld GPS and photographs taken to visually catalogue the record.

[11] Collins, J. (Ed.) (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd Edn.). The Bat Conservation Trust, London. ISBN-13 978-1-872745-96-1.

[12] Bat Tree Habitat Key (2018) Bat Roosts in Trees – A Guide to Identification and Assessment for Tree-Care and Ecology Professionals. Exeter: Pelagic Publishing

[13] NatureScot, Natural England, Natural Resources Wales, RenewableUK, Scottish Power Renewables, Ecotricity Ltd, the University of Exeter, the Bat Conservation Trust, (2021) Bats and onshore wind turbines: Survey, Assessment and Mitigation. Available from: https://www.nature.scot/doc/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation/

Table 8A.1: Suitability Categorisation

	Description of Roosting Habitats	Commuting and Foraging Habitats
Negligible	Negligible habitat features on site likely to be used by roosting bats	Negligible habitat features on site likely to be used by commuting or foraging bats.
Low	A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and / or suitable surrounding habitats to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation). A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roost potential.	Habitat that could be used by small numbers of commuting bats such as a 'gappy' hedgerow or unvegetated stream, but isolated and not well connected to the surrounding landscape by other habitat. Suitable, but not isolated habitat that could be used by small numbers of foraging bats such as a lone tree (not in a parkland situation) or a patch of scrub.
Moderate	A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessment in this table is made irrespective of species conservation status, which is established after presence is confirmed).	Continuous habitat connected to the wider landscape that could be used by bats for commuting such as lines of trees and scrub or linked back gardens. Habitat that is connected to the wider landscape that could be used by bats for foraging such as trees, scrub, grassland or water.
High	A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitats.	Continuous, high-quality habitat that is well connected to the wider landscape that is likely to be used regularly by commuting bats such as river valleys, streams, hedgerows, lines of trees and woodland edge. High quality habitat that is well connected to the wider landscape that is likely to be used regularly by foraging bats such as broadleaved woodland, tree lined watercourses and grazed parkland. A site that is close to and connected to known roosts.

Water vole (Arvicola amphibius)

1.3.17 The methodology prescribed in Dean *et al*. (2016)[14] was followed in order to search for field signs of water vole. The signs searched for included:

- faeces – recognisable by their size, shape and content. If not too dried-out these are also distinguishable from rat droppings by their smell;
- feeding stations – food items are often brought to feeding stations along pathways and hauled onto platforms. Recognisable as neat piles of chewed vegetation up to 10cm long;

[14] Dean, M., Strachan, R., Gow, D. and Andrews, R. (2016) The Water Vole Mitigation Handbook. The Mammal Society Mitigation Guidance Series. The Mammal Society, London.

- furrows – appear as a series of holes along the water's edge distinguishable from rat burrows by size and position;
- lawns – may appear as grazed areas around land holes;
- nests – where the water table is high, above ground woven nests may be found;
- footprints – tracks may occur at the water's edge and lead into bankside vegetation. May be distinguishable from rat footprints by size; and
- runways – low tunnels pushed through vegetation near the water's edge, less obvious than rat runs.

1.3.18 Any of the above signs can be taken as diagnostic evidence that water vole are present in the area. Any evidence of water vole presence was recorded onto 1:10,000 scale survey maps in the field. The location of all signs was also recorded via the use of a handheld GPS and photographs taken to visually catalogue the record.

Incidental Recordings

1.3.19 During surveys for the above species, if signs of other protected species (e.g. Scottish wildcat) or features of particular importance (i.e. potential reptile hibernacula) were encountered, these were also recorded.